Tensegrity Leg/Foot

model 05-TLF-4.2

Biotensegrity Modeling of the Leg and Foot

The representation of the leg and foot combines several different tensegrity elements. The pelvic connection is indicated by an expanded octahedral tensegrity (see the tensegrity pelvis study guide). The knee joint is modeled by an octahedral tensegrity that transfers weight from the femur and torso above, to the tibia and foot below, and yet allows flexion and dorsiflexion in the knee and ankle.

As the condyles in the femur and tibia interdigitate, their surfaces do not touch; tension forces cross multiple joints and simple lever models with fixed fulcrums do not apply.

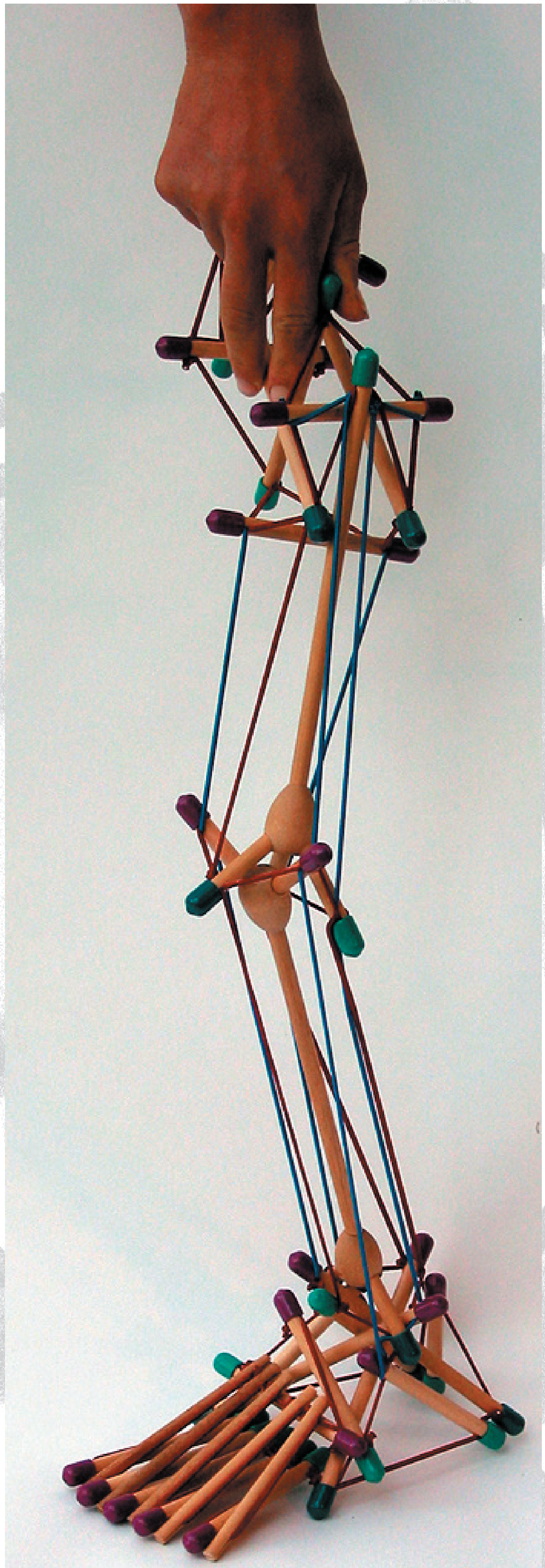
The human torso is enantiomorphic or bilaterally symmetrical and rotational tensegrity forms are required when modeling the foot. The forces transferred from the tibia to the talus and the calcaneus, are distributed using a four strut rotational tensegrity. Additional struts, suggesting the tarsals and metatarsals are added to create the essential stability of the structure's medial and lateral arches.

The resulting form is self-supporting, yet none of the compression elements are in direct weight-bearing contact.

Proper gait requires dorsiflexion of the foot on landing and plantar flexion on lift off and a biotensegrity model of the leg and foot includes these functions in the tensional linkage between the knee and ankle. A prosthetic leg and foot based upon this model would thus feel proprioceptively correct to the wearer.

The concept of biotensegrity offers a better framework than traditional biomechanics to explain how living structures are adapted to withstand dynamic stresses and yet remain structurally flexible and durable.

Better description means better prescription, which means more successful treatment methods to benefit patients and clients.



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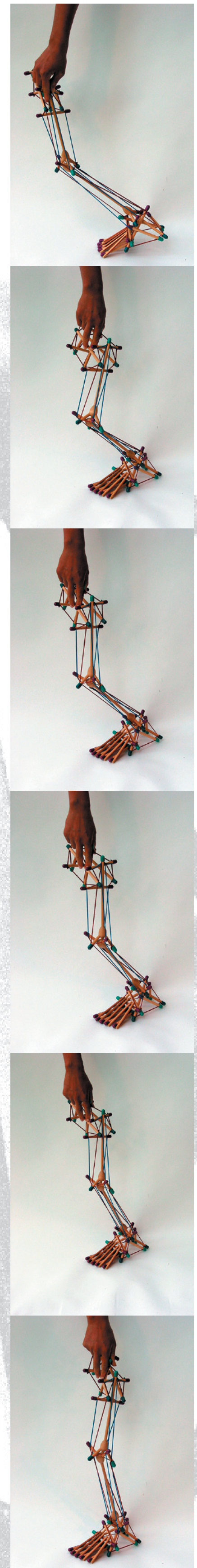

walking motion